Assignment 4

Textbook Assignment: "Pressurization and Air-Conditioning Systems." Pages 3-2 through 3-16.

Learning Objective: *Recognize the need for environmental Control systems.*

4-1. Which of the following factors is of primary importance to the manufacture of pressurized aircraft cabins?

1. The cabin area must be large enough to accommodate the pressurized components
2. The cabin area must be limited in size in order to adequately pressurize it
3. The cabin must be designed to withstand the necessary pressure differential
4. All pressurizing components must be strategically located for ease of maintenance

4-2. Which of the following components protects the cabin from excessive pressures?

1. Cabin pressure valve
2. Cabin safety valve
3. Cabin pressure regulator
4. Cabin air check valve

4-3. On jet aircraft, air for pressurizing the cabin is supplied by which of the following engine sections?

1. Air inlet
2. Accessory
3. Turbine
4. Compressor

4-4. Which of the following statements best explains the method for controlling cabin pressure?

1. A bleed valve is installed in the cabin air line
2. A regulator is installed to limit the air exiting the cabin
3. A regulator is installed to limit the air entering the cabin
4. A controlled orifice is installed in the cabin inlet air line

4-5. Which of the following aircraft systems are classified as environmental systems?

1. Deicing, defagging, rain removal, and pressurization systems
2. Anti–icing, air-conditioning equipment cooling, and windshield washing systems
3. Deicing, anti-icing, air-conditioning, and defogging systems
4. Defogging, rain removal, pressurization, and air-conditioning systems

ITEMS 4-6 THROUGH 4-15 PERTAIN TO THE SYSTEM USED ON THE F-18 AIRCRAFT.

4–6. When the environmental system on the aircraft is in operation with one engine shut down, what component prevents bleed air from the operating engine from being lost when the engine is shut down?

1. Air pressure regulation valve
2. Engine bleed–air check valve
3. Reverse flow valve
4. Spring-loaded shutoff valve

4-7. What is the purpose of the two overpressure switches in the bleed-air system?

1. To protect the system components from damage due to excessive pressure
2. To prevent excessive pressure buildup in the engine compressor section
3. To maintain the desired pressure in the cabin during cabin pressurization
4. To vent pressure overboard when excessive pressure exists in the air-conditioning system

4-8. When electrical failure occurs in an operating air-conditioning system, what action is taken by the spring-loaded engine bleed-air pressure regulation valve?

1. It remains in the position it was in at the time of electrical failure
2. It is powered to the open position by the spring tension
3. It is powered to the closed position by spring tension
4. It requires manual operation to the desired position

4-9. What component) in the bleed-air system maintain bleed-air pressure from the engines within 75±15 psi?

1. Engine bleed check valves
2. Primary bleed-air over–pressure switch
3. Engine bleed-air pressure regulation and shutoff valves
4. Engine bleed-air secondary pressure regulating and shutoff valves

4–10. In the event bleed-air pressure becomes higher than normal due to a malfunction, what component in the system will take over and regulate air pressure?

1. Engine bleed-air secondary pressure regulating and shutoff valve
2. Engine bleed check valve
3. Primary bleed–air over–pressure switch
4. Secondary bleed-air over–pressure switch

4-11. Which of the following statements is correct regarding the purpose/ function of the primary bleed-air overpressure switch?

1. The switch will activate at 250 psi maintaining the system at that pressure when normal regulation fails
2. Activation of the switch will give maintenance personnel data for determining mal–functions in the bleed-air system
3. The switch will activate a digital display indicator on the instrument panel warning the pilot of a bleed–air system failure
4. Activation of the switch will close three pressure regulator shutoff valves, shutting down the bleed-air system

4-12. Which of the following circumstances will cause the secondary bleed-air overpressure switch to activate?

1. Right engine bleed–air pressure-regulator and shutoff valve failure only
2. Left engine bleed-air pressure regulator and shutoff valve failure only
3. Failure of both right, and left engine bleed-air pressure regulation and shutoff valves
4. Bleed-air pressure downstream of the secondary bleed-air regulator exceeds 150±10 psi

4-13. What valve(s) in the bleed-air system provide(s) bleed air from the operating engine to start the second engine?

1. Engine bleed-air check valve
2. Air isolation valve
3. Engine bleed–air secondary pressure valve
4. Engine bleed-air pressure valve

4-14. Aircraft APU air can be used to augment engine bleed air for operating the aircraft air-conditioning system. What valve(s) in the bleed-air system provide(s) air for this feature?

1. Air isolation valve
2. Engine bleed-air check valve
3. Engine bleed-air secondary pressure valve
4. Engine bleed-air pressure valves

4-15. What is the function of the control unit in the bleed-air " leak detection system?

1. To close the bleed-air pressure regulator when an overheat condition occurs in the system only
2. To operate a warning light on the advisory panel when an overheat condition occurs in the system only
3. To close the bleed-air pressure regulator and light a warning light on the advisory panel when overheat occurs in the system
4. To provide a means for selecting a nonleaking system for backup

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Learning Objective: *Recognize the operating principles and components of the air cycle air-conditioning system.*

4-16. Air cycle air-conditioning systems are used in most naval aircraft for which of the following reasons?

1. The overall costs for installation and operation of air cycle systems are lower
2. Refrigerant systems do not function well at high altitudes
3. Refrigerant systems are more difficult to maintain
4. Air cycle systems are efficient for their weight and the space required and are relatively trouble free

ITEMS 4-17 THROUGH 4-54 PERTAIN TO THE AIR-CONDITIONING SYSTEM IN THE F-18 AIRCRAFT.

4-17. What is the source of the cooling air used to cool bleed air in the primary and secondary heat exchangers?

1. RAM air/outside air flowing across the heat exchangers
2. AFU air being ejected across the heat exchangers
3. Bleed air modulated by a system pressure regulator valve ejected across the heat exchanger
4. Bleed air forced through the heat exchanger by the turbine compressor

4-18. What is the purpose of the secondary heat exchanger?

1. To cool the bleed air after it leaves the engine compressor section
2. To cool the bleed air before it is ejected into the primary heat exchanger
3. To cool the bleed air coming from the compressor end of the refrigeration turbine/ compressor
4. To increase the temperature of the bleed air before it enters the refrigeration turbine/compressor

4-19. What system component cools bleed air by the rapid expansion method?

1. Refrigeration compressor
2. Primary heat exchanger
3. Secondary heat exchanger
4. Refrigeration turbine

IN ITEMS 4-20 THROUGH 4-26, SELECT FROM COLUMN B THE COMPONENT THAT IS RESPONSIBLE FOR THE FUNCTION LISTED IN COLUMN A. COMPONENTS IN COLUMN B MAY BE USED MORE THAN ONCE.

	A. Functioms	B. Components
4-20.	Cools hot engine bleed air	1. Primary ejector valve
4-21.	Cools air on the same principle that a car radiator cools water	2. Primary heat exchanger
4-22.	Controls flow of bleed air to primary heat exchanger ejectors	3. Avionics RAM air servo
4-23.	Uses the electrical signals from the avionics temperature flow sensor	4. Flow modulating system pressure regulator valve
4-24.	Protects the refrigeration turbine from heat damage during overtemperature conditions	
4-25.	Monitors the differential pressure of the bleeder air up and downstream of the flow modulating system pressure regulator valve	
4-26.	Ensures that a sufficient amount of cooling air goes to the avionics systems	

4-27. When an overtemperature exists in the turbine or compressor section of the refrigeration turbine/ compressor assembly, the protective temperature sensors will cause which of the following conditions to occur?

1. The sensor sensing the overtemperature will close the flow maculating system pressure regulator and cause turbine speed to decrease
2. The sensor sensing the overtemperature will close the engine bleed-air pressure regulation and shutoff valve on the engine producing the overtemperature
3. The sensor sensing the overtemperature will close the engine bleed-air check valve on the engine producing the overtemperature
4. The compressor temperature sensor closes the flow modulating system pressure regulator and the turbine temperature sensor closes the affected engine bleed-air check-valve

IN ITEMS 4-28 THROUGH 4-33, SELECT FROM COLUMN B THE COMPONENT THAT IS RESPONSIBLE FOR THE FUNCTION LISTED IN COLUMN A. COMPONENTS IN COLUMN B MAY BE USED MORE THAN ONCE.

	A. Functions	B. Components
4-28.	Receives the air from the compressor section of the refrigeration turbine/ compressor assembly	1. Secondary ejector valve 2. Secondary heat exchanger 3. Reheater heat exchanger 4. Water spray nozzle
4-29.	Controlled by an electrical signal from the air data computer	
4-30.	Controls the flow of bleed air to the secondary heat exchanger ejector	
4-31.	Aids in cooling the inlet air entering the secondary heat exchange	
4-32.	Uses the water that is extracted from the conditioned air	
4-33.	Cools air before moisture removal and heats air after moisture removal	

REFER TO FIGURE 4-2 AND SUPPORTING MATERIAL IN THE TEXT TO ANSWER ITEMS 4-34 THROUGH 4-33.

4-34. The air used for cooling in the condenser/vent suit heat exchanger comes directly from which of the following components?

1. The reheater heat exchanger
2. The secondary heat exchanger
3. The water extractor
4. The turbine/compressor assembly

4-35. The air to be cooled in the condenser/vent suit heat exchanger comes directly from which of the following component?

1. The turbine/compressor assembly
2. The hot side of the reheater
3. The secondary heat exchanger
4. The primary heat exchanger

4-36. The purpose of the water extractor to extract water from the air coming directly from which of the following components?

1. The reheater heat exchanger
2. The secondary heat exchanger
3. The condenser/vent suit heat exchanger
4. The turbine compressor assembly

4-37. The water removed by the water extractor is used for which of the following purposes?

1. Suit ventilation
2. Augment ram air cooling in the secondary heat exchanger
3. Supply ram air to the secondary heat exchanger
4. Supply dry air to the reheater heat exchanger

4-38. Air exiting the turbine end of the turbine compressor assembly is used for which of the following purposes?

1. To operate the flow modulating system pressure regulator
2. To provide air to the secondary heat exchanger
3. To provide air for environmental control
4. To provide air to the avionics ram air servo

4-39. What component prevents icing in the condensor/vent suit heat exchanger?

1. Turbine compressor assembly
2. Anti-ice add heat valve
3. Avionics ram air servo
4. Reheater heat exchanger

ITEMS 4-40 THROUGH 4-45 PERTAIN TO COMMON AIR-CONDITIONING COMPONENTS.

4-40. Which of the following components is used in bleed air ducting to compensate for duct expansion due to high temperatures?

1. Flexible line connectors
2. Marmon clamps
3. Thermal compensators
4. Flexible mounting brackets

4-41. Which of the following statements is correct concerning the materials bleed air and air-conditioning distribution lines are made of?

1. Air-conditioning lines are made of stainless steel and bleed-air lines of aluminum alloy
2. Air-conditioning and bleed-air lines are both made of stainless steel
3. Bleed-air lines and air-conditioning lines are both made of aluminum alloy
4. Bleed-air lines are made of stainless steel and air-conditioning distribution lines of aluminum alloy

4-42. Excessive torquing of clamps used in bleed-air air-conditioning systems will cause which of the following results?

1. Sructural loads on the ducting
2. Structural loads on support brackets
3. Structural loads on the clamping devices
4. Ruptures in the system ducting

4-43. When installing a base between two duct sections, what is the minimum and maximum distance allowed between the duct ends?

1. 1/8 inch minimum, 1/4 inch maximum
2. 1/8 inch minimum, 3/4 inch maximum
3. 1/4 inch minimum, 1/2 inch maximum
4. 1/4 inch minimum, 3/4 inch maximum

4-44. When installing a hose between two ducts, what is the maximum misalignment allowed between the two duct ends?

1. 1/8 inch
2. 1/4 inch
3. 3/8 inch
4. 1/2 inch

4-45. When installing rigid couplings on ducting, which of the following methods is used to assure proper alignment of the flanges in the couplings?

1. Tighten coupling until gap is completely closed, then back off 1/4 turn on the nut
2. Torque coupling to prescribed torque, tap around coupling with a plastic mallet and retorque to an additional 10 percent of prescribed torque
3. Tighten coupling firmly, tap around outer surface of coupling with a plastic mallet, then tighten coupling to prescribed torque valve
4. Torque coupling to torque valve, check clamp for proper position, then retorque to an additional 10 percent of original torque valve

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Learning Objective: *Recognize the components and functions of the cabin cooling and antifog system.*

ITEMS 4-46 THROUGH 4-52 PERTAIN TO THE CABIN COOLING AND ANTIFOG SYSTEM ON THE F-18 AIRCRAFT.

4-46. When an increase in air temperature is desired in the cabin, air is routed through which of the following components?

1. Cabin/defog ram air control valve
2. Cabin add heat valve
3. Cabin flow valve
4. Anti-ice add heat valve

4-47. Distribution of conditioned air to the cabin can be divided between air used for the cabin and air used for defogging the windshield. This distribution is accomplished by what action?

1. Selecting the appropriate position on the suit/cabin temperature control valve
2. Selecting the appropriate position on the air-conditioning system temperature/flow controller
3. Selecting the appropriate position on the windshield defogging switch
4. Selecting the appropriate position on the cabin defog plenum distribution valve with a control handle

4-48. Which of the following components provides the electrical signal that determines the position of the cabin add heat valve?

1. Cabin air overtemperature sensor
2. Cabin airflow\temperature sensor
3. Cabin/defog plenum distribution valve
4. Suit/cabin temperature control

4-49. Which of the following actions explains how air pressure and spring tension operate the cabin add heat valve?

1. Venting air pressure from the valve allows the valve to close against spring tension
2. Venting air pressure from the valve allows the valve to open under spring tension
3. Regulated air pressure to the valve and spring tension aid in opening the valve
4. Regulated air pressure to the valve overcomes spring tension opening the valve

4-50. When an overtemperature occurs in the cabin cooling system, the cabin air overtemperature sensor allows which of the following actions?

1. The cabin flow valve to open
2. The cabin/defog plenum distribution valve to close
3. The cabin add heat valve to close
4. The cabin ram air check valve to open

4-51. What component(s) in the cabin cooling and antifog system provide(s) for the automatic operation of the cabin flow valve?

1. Cabin/defog ram air solenoid only
2. Cabin/defog ram air solenoid and the cabin overtemperature sensor
3. Cabin airflow/temperature sensor only
4. Cabin airflow/temperature sensor and the air–conditioning system temperature/flow controller

4-52. Which of the following statements is correct regarding the automatic drain valve in the cabin cooling and antifog system?

1. It relieves excessive pressure
2. It regulates pressure in the system
3. It is open to drain moisture from the supply duct, it closes when pressure is applied
4. It drains the system of moisture when the switch on the air-conditioning system temperature/flow controller is turned on, and it closes automatically when pressure is applied to the system

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Learning Objective:
Recognize the source for avionics cooling air and identify the components of the avionic cooling system and the function of each component.

ITEMS 4-53 THROUGH 4-62 PERTAIN TO THE F-18 AVIONICS COOLING SYSTEM.

4-53. The air taken from the aircraft air-conditioning system to cool avionic equipment is controlled by which of the following components?

1. ECM cooling air control valve only
2. Avionics RAM air valve only
3. ECM cooling air control valve and avionics ram air valve
4. Avionics flow/temperature sensor and temperature/flow controller

4-54. A pressure differential of 1.5 psi between the avionics cooling system and the air cycle air-conditioning system is maintained by which of the following components?

1. Avionics flow/temperature sensor
2. Avionics flow valve
3. ECM cooling air control valve
4. Avionics ram air valve

4-55. Air that comes through the avionics ram air valve to augment avionics cooling comes from which of the following sources?

1. Secondary heat exchanger ram air inlet
2. Liquid cooling system
3. Emergency ram air scoop
4. Air cycle air-conditioning system

4-56. What component in the avionics cooling system operates the avionics ram air valve?

1. Avionics flow/temperature sensor
2. Pressure switch and the secondary heat exchanger
3. ECM cooling air central valve
4. Avionics ram air servo

4-57. Which of the following components controls the amount of airflow that will be directed to the ECM equipment for cooling purposes?

1. Avionics ram air valve
2. Emergency ram air scoop
3. ECM cooling air control valve
4. Avionics fan control pressure switch

4-58. What component controls the position of the ECM cooling air control valve?

1. ECM made switch
2. ECM cooling air control valve switch
3. Avionics fan control pressure switch
4. Avionics airflow control valve switch

4-59. Under which of the following conditions does the aircrafts avionics ground cooling fan cool avionics equipment?

1. During ground operation only
2. During ground operation and taxi only
3. During takeoffs only
4. During ground operation, taxi, takeoffs, and landings

4-60. (Refer to figure 3-11 and supporting material in the text.) What prevents cooling air in the avionics system from escaping through the ground cooling duct during flight?

1. Avionics ram air check valve
2. Nose wheel well plenum check valve
3. Avionics fan check valve
4. Avionics airflow check valve

4-61. (Refer to figure 3-11 and supporting material in the text.) The avionics fan control pressure switch will operate the avionics ground cooling fan when which of the following conditions exist?

1. During low airspeed flight operation
2. During all flight and ground operation
3. When the avionics ram air valve fails
4. When the air cycle air-conditioning system’s pressure is below 26±1 psig

4-62. The emergency ram air scoop provides-ram air cooling for essential conditions. The air scoop is activated by which of the following components?

1. Air-conditioning system temperature/flow controller
2. Avionics temperature/flow sensor
3. FCS cool switch
4. Ram air pressure control switch